slightly lower at the same location (MW-1) of the maximum concentration observed in the 1995 study. The only inorganic found to exceed its maximum contaminant level in perched water was chromium. Chromium exceedances were found in all the perched water bodies. The only organic was methylene chloride from well PW-1. The highest radioactive contaminant levels (strontium-90 and technetium-99) continue to be found in the northern upper perched water body. Tritium is the primary contaminant found in the southern upper perched water body. Gross alpha and beta were not analyzed in 2001. The maximum radiological contaminant levels for strontium-90, technetium-99 and tritium have decreased by as much as 50 percent since the 1995 study (DOE 2002a).

For the Snake River Plain Aquifer, the concentrations measured in the 1995 study are primarily related to the past disposal of waste through the INTEC injection well. The injection well was drilled to a depth of 598 feet (DOE 1993) and was routinely used for disposal of service waste water through 1984, and permanently closed by pressure grouting in 1989. An estimated 22,000 curies of radioactive contaminants were released through the injection well. Most of the radioactivity is attributed to tritium (96 percent). Americium-241, technetium-99, strontium-90, cesium-137, cobalt-60, iodine-129, and plutonium contribute the remaining radioactivity.

Figures 4-1***3,*** 4-1***4,*** and 4-1***5*** show the 1995 distribution of tritium, strontium-90, and the 1990-1992 distribution of iodine-129 in the aquifer beneath INEEL, respectively (DOE 1997). ***The figures were not updated for 2001 due to the limited data set available for contouring groundwater in 2001 (DOE 2002b).*** Additionally, Table 4-***20*** shows the general trend of decreasing concentrations of these radionuclides over time ***including the most current data from 2001***. The combined tritium disposal to infiltration ponds at INTEC and the Test Reactor Area from 1992 to 1995 averaged 107 curies per year, compared to 910 curies per year from 1952 to 1983 (DOE 1997). The tritium plume with a concentration exceeding 500 picocuries per liter (0.5 picocuries per milliliter) decreased from an area of 45 square miles in 1988 to about 40 square miles in 1991. Since 1991, the concentration has remained nearly unchanged. However, the higher concentration lines have moved closer to their origin at INTEC and the Test Reactor Area.

Prior to 1989, strontium-90 concentrations in the Snake River Plain Aquifer were decreasing. The concentrations from 1992 to ***2001*** have remained fairly constant. This is due to the migration of contamination from the near surface releases into the perched water bodies and subsequently into the Snake River Plain Aquifer (Rodriguez et al. 1997). When the Big Lost River flows the added infiltrating water will tend to reduce the concentrations observed in the Snake River Plain Aquifer due to dilution of the perched water bodies.

Iodine-129 was discharged to the aquifer until 1984 through the injection well previously described. More than 90 percent of the iodine-129 in the aquifer is from the injection well. Smaller contributions include the percolation ponds and contaminated soils. Measurements taken in 1990-1992 indicated the presence of iodine-129 in 32 of 51 wells at INTEC. The concentrations ranged from below the detection limit to 3.82 pCi/L (Rodriguez et al. 1997). ***In 2001, only 2 of 41 wells sampled detected iodine-129 above the maximum contaminant level. The two wells are located south of INTEC at the CFA landfill. In addition, iodine-129 was not detected in the sample analyzed from well USGS-46 as depicted in Table 4-20 (DOE 2002b).*** The Safe Drinking Water Act maximum contaminant level for iodine-129 is 1 pCi/L.

4.9 Ecological Resources

This section discusses the biotic resources of the INEEL including threatened, endangered, and sensitive species, and wetlands. Radioecology studies specific to INTEC are also discussed. A detailed description of INEEL ecology can be reviewed in the Ecological Resources section of Rope et al. (1993) and the SNF & INEL EIS, Volume 2, Part A, Section 4.9 (DOE 1995). ***However, DOE has updated Section 4.9.1, Plant Communities and Associations, with more recent information on range fires that occurred in 1999 and 2000.***

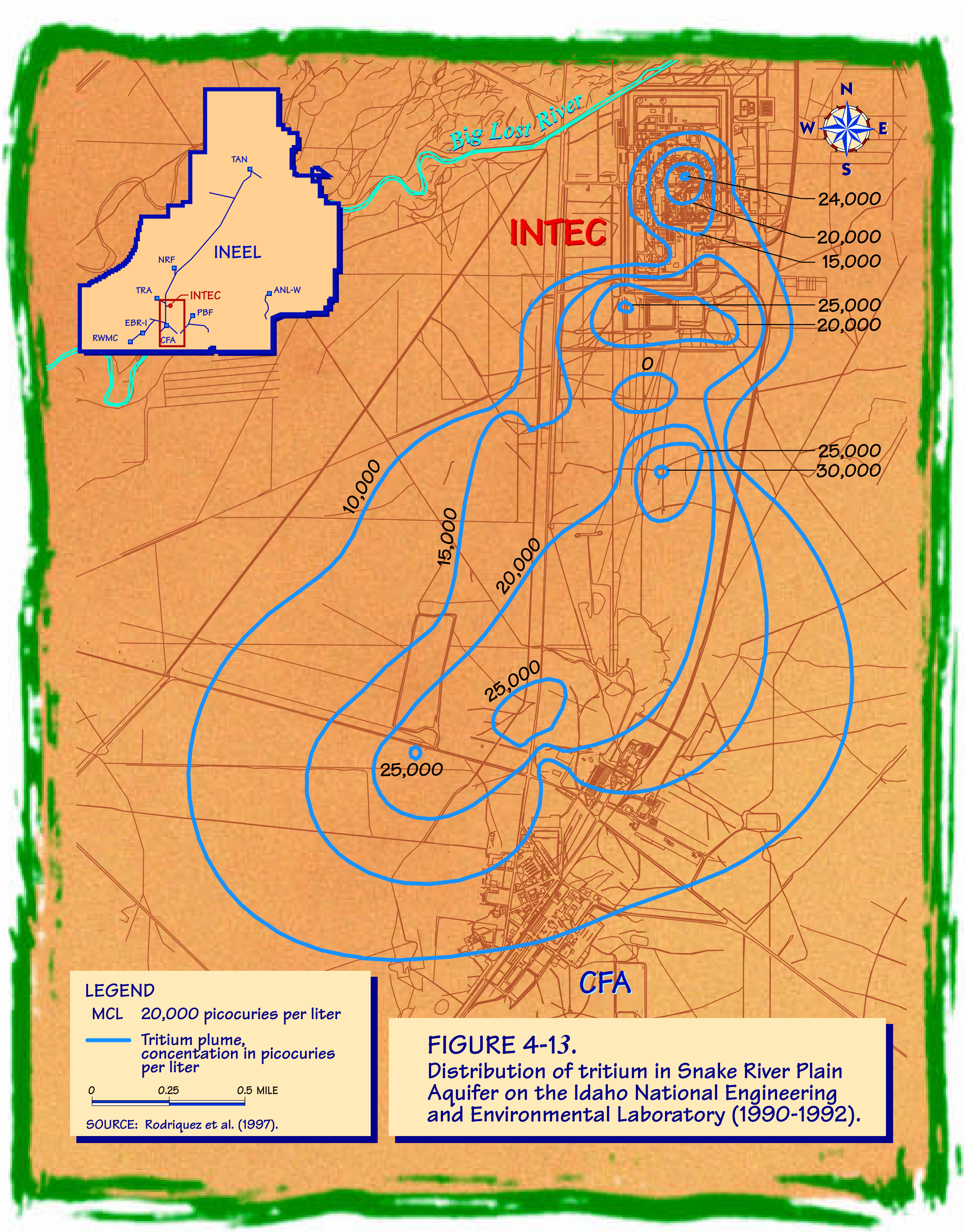


FIGURE 4-13.
Distribution of tritium in Snake River Plain Aquifer on the Idaho National Engineering and Environmental Laboratory (1990-1992).

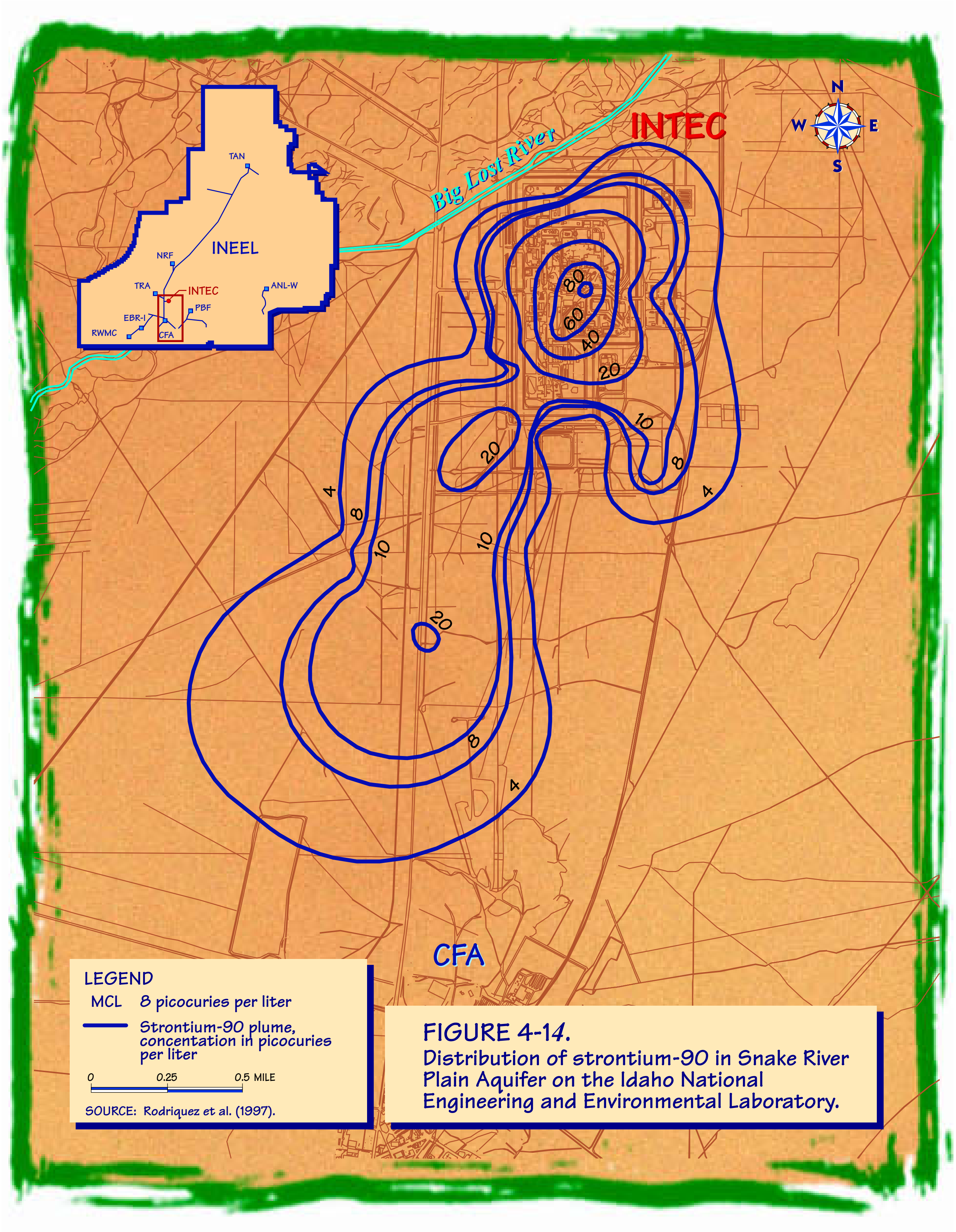


FIGURE 4-14.
Distribution of strontium-90 in Snake River Plain Aquifer on the Idaho National Engineering and Environmental Laboratory.

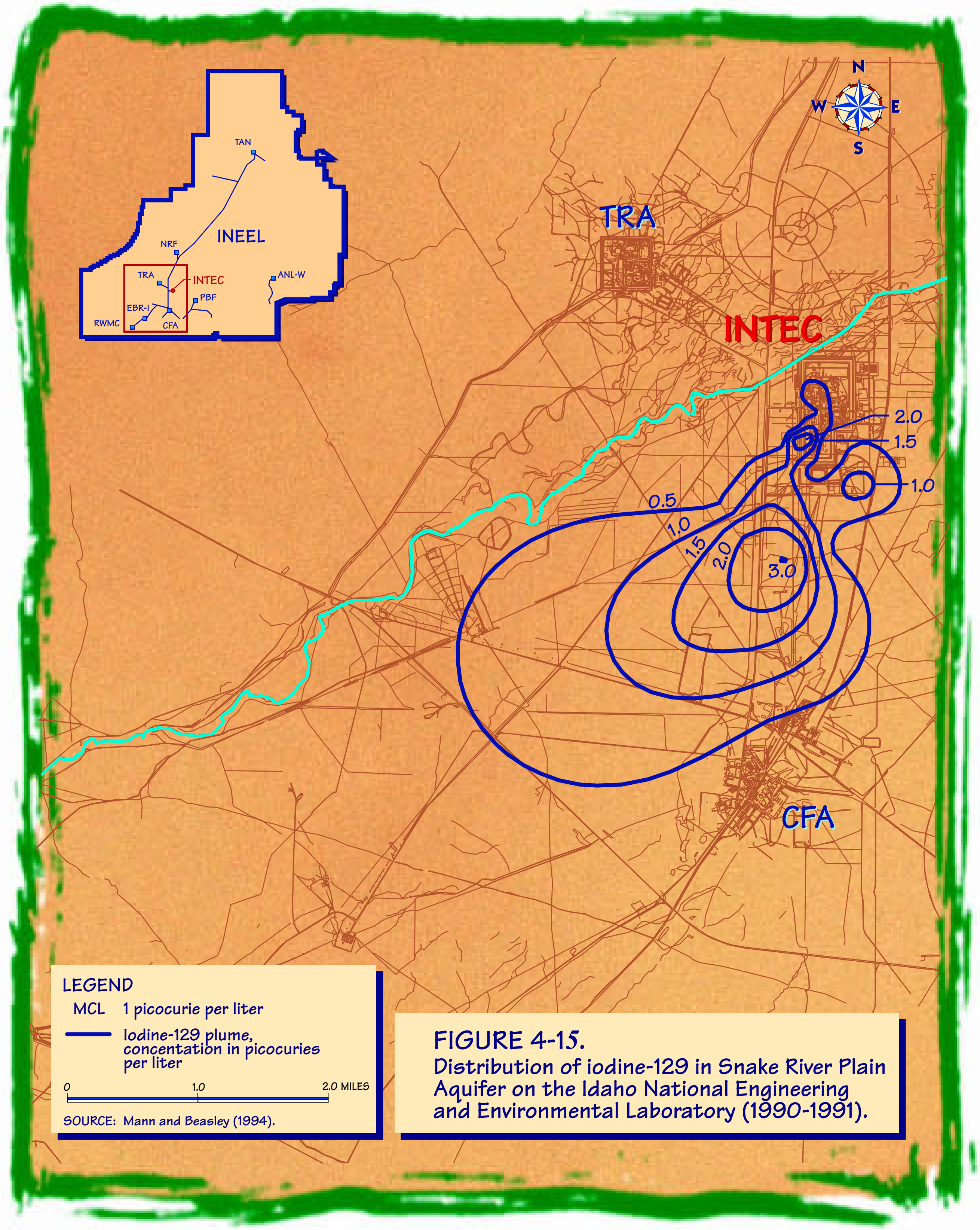


FIGURE 4-15.
Distribution of iodine-129 in Snake River Plain Aquifer on the Idaho National Engineering and Environmental Laboratory (1990-1991).

Table 4-*20*. Trends in tritium, strontium-90, and iodine-129 in selected wells at the INEEL.

	Concentration[a] (pCi/L)		
Year	Tritium[b] (USGS-77)	Strontium-90[b] (USGS-47)	Iodine-129[c] (USGS-46)
1981	80,000 ± 800	79 ± 5	41 ± 2
1986	70,000 ± 900	56 ± 4	2.3 ± 0.3
1991	42,000 ± 900	55 ± 4	0.35 ± 0.02
1995	25,000 ± 100	47 ± 2	–
2001	***11,500 ± 613[d]***	***45 ± 7.57[d]***	***ND[d]***

a. The concentrations shown are for selected wells on the INEEL, not necessarily the maximum concentrations measured at the INEEL or at INTEC.

b. Source: Bartholomay et al. (1997).

c. Source: 1981 and 1986 data - Mann et al. (1988); 1991 data – Mann and Beasley (1994).

d. ***Source: DOE (2002b). ND = not detected***

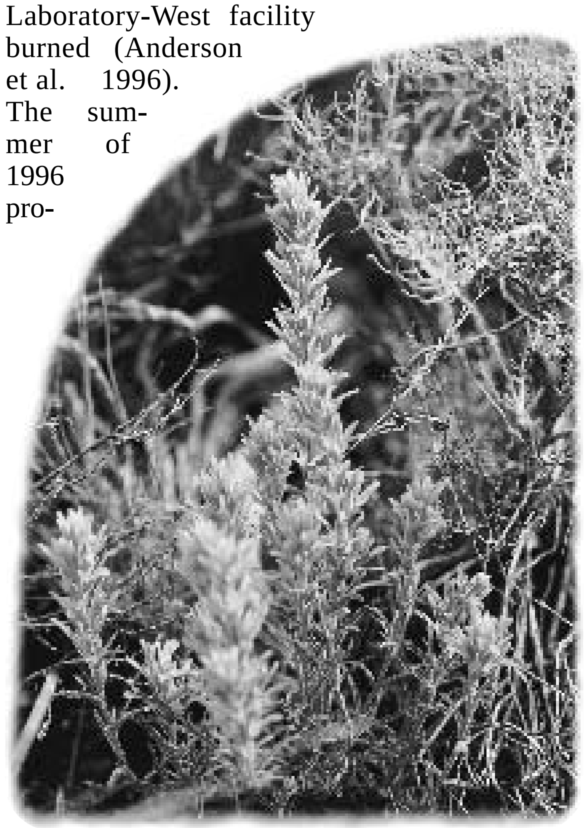
4.9.1 PLANT COMMUNITIES AND ASSOCIATIONS

INEEL lies within a cool desert ecosystem dominated by shrub-steppe vegetation. The area is relatively undisturbed, providing important habitat for species native to the region. Vegetation and habitat on INEEL can be grouped into six types: shrub-steppe, juniper woodlands, native grasslands, modified ephemeral playas, lava, and wetland-like areas. Figure 4-***16*** shows these areas.

More than 90 percent of INEEL falls within the shrub-steppe vegetation type. The shrub-steppe vegetation type is dominated by sagebrush (*Artemisia spp.*), saltbush (*Atriplex spp.*), and rabbitbrush (*Chrysothamnus spp.*). Grasses found on INEEL include cheatgrass (*Bromus tectorum*), Indian ricegrass (*Oryzopsis hymenoides*), wheatgrass (*Agropyron spp.*), and squirreltail (*Sitanion hysterix*). Herbaceous plants or forbs such as phlox (*Phlox spp.*), wild onion (*Allium spp.*), and milkvetch (*Astragalus spp.*), weeds such as Russian thistle (*Salsola kali*), halogeton (*Halogeton glomeratus*), and various mustards occur on disturbed areas throughout the INEEL area.

Areas cleared of natural vegetation cover about 2 percent of INEEL. Vegetation in disturbed areas such as INTEC is frequently dominated by introduced annual species, including Russian thistle and cheatgrass. Introduced annuals in disturbed areas provide lower quality food and cover for wildlife than native species. Therefore, species diversity is generally lower in disturbed and developed areas and higher in undisturbed natural areas (DOE 1995).

Large wildfires in 1994, 1995, 1996, ***1999, and 2000*** played an important role in the vegetation cover at INEEL. Figure 4-***17*** shows the location of the wildfires. In July 1994, the Butte City fire burned 17,107 acres along the western boundary of INEEL (Anderson et al. 1996). In August 1995, 6,831 acres along a corridor running north and south of the Argonne National Laboratory-West facility burned (Anderson et al. 1996). The summer of 1996 pro-



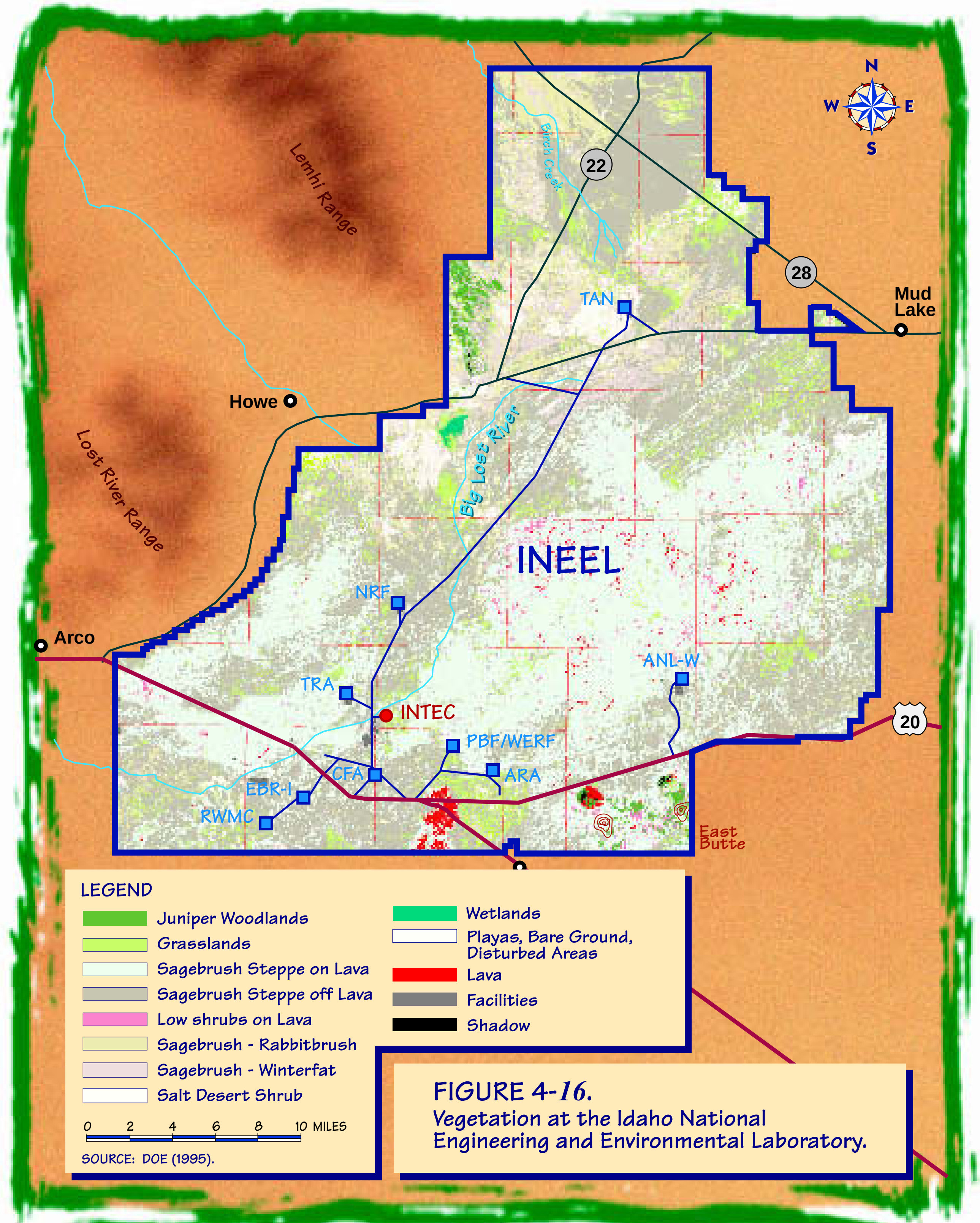


FIGURE 4-16.
Vegetation at the Idaho National Engineering and Environmental Laboratory.

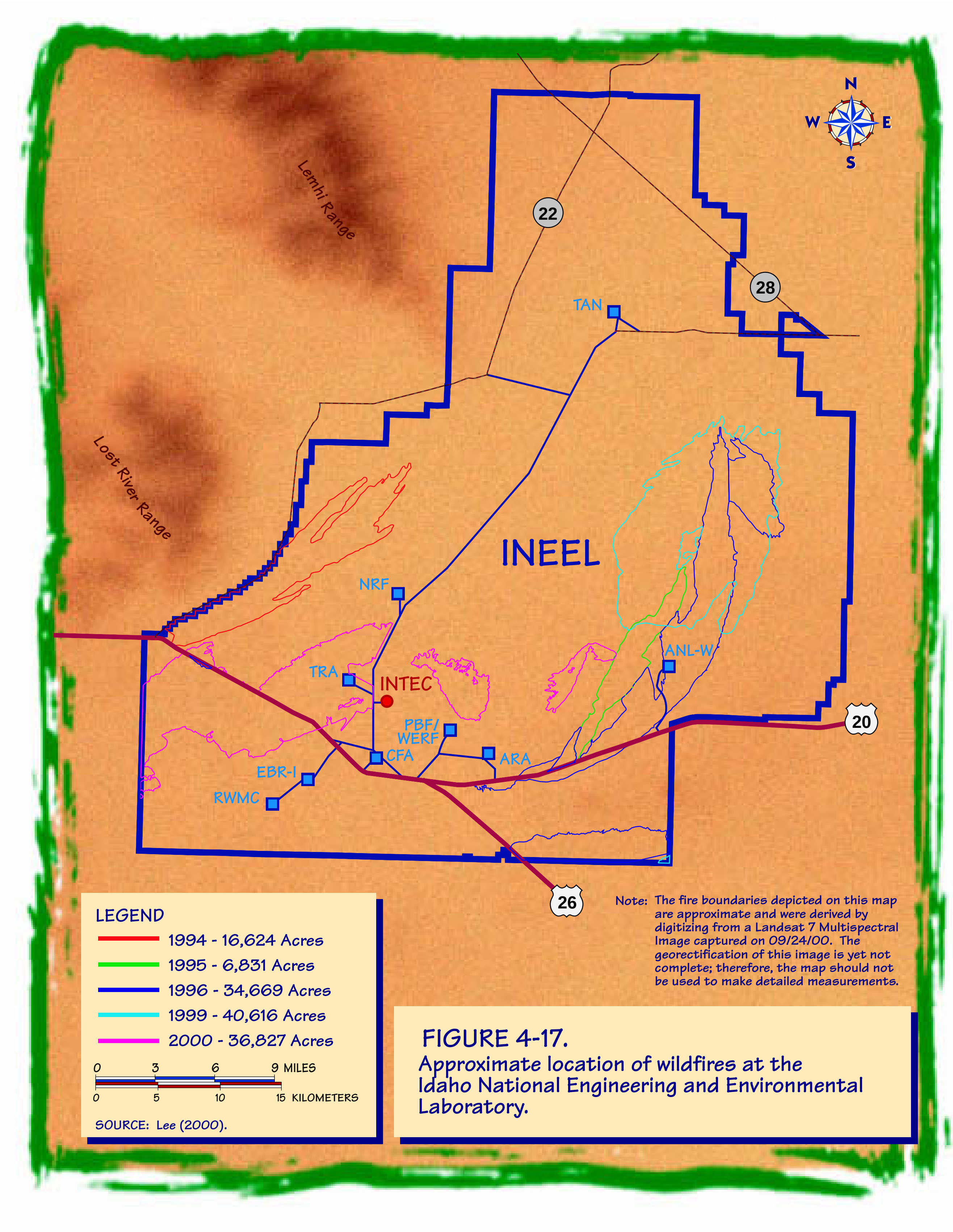
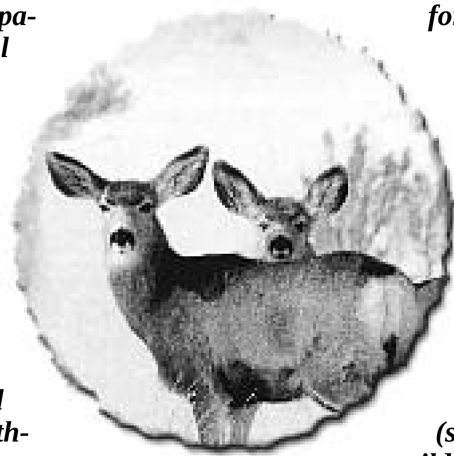


FIGURE 4-17.
Approximate location of wildfires at the Idaho National Engineering and Environmental Laboratory.

duced six fires that burned a total of 36,450 acres on and adjacent to INEEL. These fires burned virtually all of the aboveground biomass, resulting in severe wind erosion and, therefore, blowing dust (Patrick and Anderson 1997). ***Wildfires in 1999 burned approximately 40,000 more acres of the INEEL and in the summer and early fall of 2000, three separate fires burned an additional 36,000 acres. The first of these fires in late July 2000 burned approximately 30,000 acres northwest of the Radioactive Waste Management Complex. A second fire in early August burned approximately 2,000 acres west of Argonne National Laboratory-West. A third fire in mid-September burned approximately 4,000 acres northwest of INTEC.***



As a result of the 1995 Argonne burn, blowing dust created problems for normal facility operations, and health and safety concerns for Argonne National Laboratory-West employees. In an effort to control the blowing dust, erosion control activities were initiated. Spring wheat was planted on about 160 acres immediately upwind of the Argonne National Laboratory-West facility to provide a cover crop. A monitoring program was implemented by the Environmental Science and Research Foundation to determine the effects of introducing a non-native plant species. Data collected showed that the wheat planting reduced the number of native species by more than one-half. The impacts from this planting are believed to be due to the physical damage caused by the mechanical drilling of seeds and the added competition for water and nutrients from the wheat (Blew and Jones 1998).

After the fires in July of 1996, soil erosion control was again necessary. A seed mixture of crested wheatgrass (*Agropyron cristatum*), pubescent wheatgrass (*Elytrigia intermedia*), and thickspike wheatgrass (*Elymus lanceolatus*), including oats (*Avena sativa*) to serve as a crop cover, was planted in late summer on approximately 320 acres. Monitoring activities are being conducted to determine the impacts, if any, on long-term recovery of native vegetation in this area.

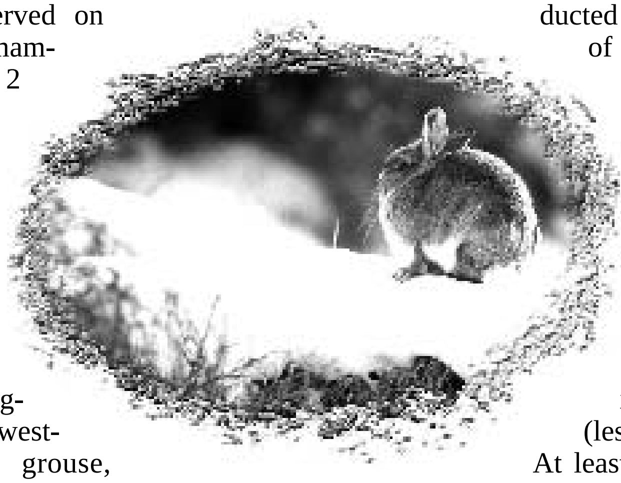
DOE has been conducting additional monitoring of the areas burned in 1994, 1995, and 1996 to measure the recovery of native desert vegetation and provide recommendations for a comprehensive INEEL fire management plan. Preliminary monitoring results indicate that non-native annual plants, such as cheatgrass, had not replaced native plant species in burned areas. Native shrubs, perennial grasses, and forbs recovered rapidly in areas where healthy stands existed prior to the fire (ESRF 1999). Sagebrush, the dominant shrub of these desert (shrub-steppe) areas, is killed by wildfire and is slow to recolonize areas that are completely burned. Most native shrubs, perennial grasses, and forbs regenerate from underground root systems, while most sagebrush species must regenerate from seed.

Although the lush growth of grasses and forbs that typically follows wildfires in sagebrush-steppe areas of the INEEL provides nutritious food for foraging mule deer, pronghorn, and elk (ESRF 1999), those plants do not provide suitable winter habitat and food for sage grouse. Sage grouse are dependent on sagebrush, particularly for important winter habitat (ideal winter habitat consists of healthy, mature stands of big sagebrush).

The INEEL contains one of the largest contiguous areas of protected sagebrush-steppe habitat in the world, and is one of the most important wintering areas for sage grouse in Idaho (ESRF 2000). The wildfires that have burned more than 135,000 acres of sagebrush-steppe on the INEEL since 1994 are certainly cause for concern, particularly in light of sage grouse population declines across the region. DOE is continuing to study the impacts of wildfires on the ecological resources of the site and the region in attempts to better understand the dynamics of that ecosystem and to identify ways of preserving the biodiversity on the INEEL.

4.9.2 WILDLIFE

INEEL supports wildlife typical of shrub-steppe communities. Over 270 vertebrate species have been observed on INEEL, including 46 mammal, 204 bird, 10 reptile, 2 amphibian, and 9 fish species (Arthur et al. 1984; Reynolds et al. 1986). Common wildlife include small mammals (mice, ground squirrels, rabbits, and hares), pronghorn (American antelope), deer, elk, songbirds (sage sparrow and western meadowlark), sage grouse, lizards, and snakes.



INEEL provides year-round habitat for pronghorn, elk, sage grouse, and black-tailed jackrabbits. Migratory birds common on the INEEL include waterfowl and raptors. Predators, such as bobcats ***and*** mountain lions have been observed in the area ***and coyotes are common***.

4.9.3 THREATENED, ENDANGERED, AND SENSITIVE SPECIES

Threatened and endangered species, species of concern, and other unique species known to occur within or near INEEL were identified using the Idaho Department of Fish and Game's list of *Species with Special Status in Idaho* (Idaho CDC 1997). In accordance with Section 7 of the Endangered Species Act, DOE requested a species list from the U.S. Fish and Wildlife Service. The Idaho Conservation Data Center maintains lists of species of concern for the Idaho Department of Fish and Game and the U.S. Fish and Wildlife Service.

Table 4-***21*** shows Federally-listed species, state-listed species, Federal and state species of special concern, and sensitive and unique plant species monitored by the Idaho Native Plant Society. None of these state- or Federally-listed species is known to occur in the INTEC area.

4.9.4 WETLANDS (OR WETLAND-LIKE AREAS)

The U.S. Fish and Wildlife Service conducted a wetland survey of most of the INEEL depicted in the National Wetlands Inventory map. Wetlands or wetland-like areas are primarily associated with the Big Lost River, the Big Lost River spreading areas, and the Big Lost River Sinks, although smaller isolated wetland-like areas (less than 1 acre) also occur. At least one area at the Big Lost River Sinks was found to meet the criteria for jurisdictional wetlands established by the U.S. Army Corps of Engineers. Also, one potential wetland located north of the Test Reactor Area is under evaluation to determine if it meets the definition of a jurisdictional wetland. No wetlands or wetland-like areas occur within the INTEC boundary.

The National Wetland Inventory map identified approximately 20 potential wetlands near INEEL facilities. Most of these potential wetlands are industrial waste and sewage treatment ponds, borrow pits, and gravel pits. The term "potential" is used because it has not been determined whether they exhibit the characteristics that make them jurisdictional wetlands under the Clean Water Act. Some characteristics used to determine jurisdictional wetlands are vegetation, soil type, and period of inundation. Other potential wetlands include portions of the Big Lost River channel near INTEC and the Birch Creek Playa encompassing the Test Area North. These scattered man-made ponds and intermittent waters (see Figure 4-***8***) serve as a water resource for wildlife, including mammals, songbirds, and waterfowl.

4.9.5 RADIOECOLOGY

The objective of radioecology is to determine radiological effects on ecological resources, with the long-term objective of understanding environmental cycles and the potential impacts

Table 4-21. Listed Threatened and Endangered Species, Species of Concern, and other unique species that occur, or possibly occur, on Idaho National Engineering and Environmental Laboratory.[a]

	Species	Classification Federal	Classification State	Occurrence on the INEEL
Birds	American peregrine falcon (*Falco peregrinus anatum*)	LE	E	Winter visitor
	Bald eagle *(Haliaeetus leucocephalus)*	LT	E	Winter visitor, most years
	Ferruginous hawk *(Buteo regalis)*	W	P	Widespread summer resident
	Boreal owl (*Aegolius funereus*)	W	SC	Recorded, but not confirmed
	Flammulated owl *(Otus flammeolus*)	W	SC	Recorded, but not confirmed
	Long-billed curlew *(Numenius americanus)*	SC	P	Limited summer distribution
Mammals	Gray wolf *(Canis Lupus)*	LE/XN	E	Several sightings since 1993
	Long-eared myotis *(Myotis evotis)*	W	–	Limited onsite distribution
	Townsend's big-eared bat *(Corynorhinus townsendii)*	SC	SC	Year round resident
	Pygmy rabbit *(Brachylagus idahoensis)*	W	SC	Limited onsite distribution
Plants	Ute's ladies tresses *(Spiranthes diluvialis)*	LT	INPS-GP2	Found near, but not on, INEEL
	Speal-tooth dodder *(Cuscuta denticulata)*		INPS-1	Found near, but not on, INEEL
	Spreading gilia (*Ipomopsis [Gilia] polycladon*)		INPS-2	Common in western foothills
	Lemhi milkvetch *(Astragalus aquilonius)*		INPS-GP3	Limited distribution
	Winged-seed evening primrose *(Camissonia pterosperma)*		INPS-S	Rare and limited

a. Source: Idaho CDC (1997).

Federal
LT Listed Threatened
LE Listed Endangered
XN Experimental Population
SC Special Concern
W Watch

State
E Endangered
P Protected Non-game Species
SC Special Concern
INPS-1 Idaho Native Plant Society-State Priority 1
INPS-2 Idaho Native Plant Society-State Priority 2
INPS-GP2 Idaho Native Plant Society-Global Priority 2
INPS-GP3 Idaho Native Plant Society-Global Priority 3
INPS-S Idaho Native Plant Society-Sensitive

to humans and the environment. Potential radiological effects on plants and animals are measured at the population, community, or ecosystem level. Measurable results of radionuclides on plants and animals have been observed in individuals on areas adjacent to INEEL facilities, but effects have not been observed at the population, community, or ecosystem level.

The environment surrounding INTEC has been contaminated with a variety of fission products and transuranic elements. Studies of radioactive contamination have been conducted in soil, vegetation, rabbits, pronghorn, mourning doves, sage grouse, waterfowl, and in fish from the Big Lost River near INTEC (Morris 1993).

Potentially-contaminated soils in the Windblown Area, an operable unit associated with Waste ***Area*** Group 3 but outside of INTEC, were sampled in 1993 as part of a Phase I radionuclide contaminated soil investigation (Rodriguez et al. 1997). The maximum concentration of cesium-137 in soil was 16.2 pCi/g, which was above the background concentration of 0.82 pCi/g. Other radionuclides (strontium-90, plutonium-238 and plutonium-239, uranium-234, and uranium-238) were reported as nondetectable or their concentrations were not significantly higher than background concentration. The Baseline Risk Assessment for the Windblown Area concluded that these contaminated soils did not pose an unacceptable risk to the ecolog*y of the area*.

Iodine-129 was released during the fuel dissolution process at INTEC and was transported relatively long distances by atmospheric processes. Studies of vegetation and rabbit thyroids have reported levels of iodine-129 in excess of background concentrations out to 17 miles from INTEC. Iodine-129 has been detected above background concentrations in pronghorn tissues site-wide and as far offsite as Craters of the Moon National Monument and Monida Pass (Morris 1993).

4.10 Traffic and Transportation

This section discusses existing traffic volumes, transportation routes, transportation accidents, and waste and materials transportation at INEEL, including historical waste and materials transportation and baseline radiological exposures from waste and materials transportation. It also discusses noise levels at INEEL associated with the various modes of transportation. The information in this section has been summarized from Lehto (1993) and Anderson (1998) and is tiered from Volume 2 of the SNF & INEL EIS (DOE 1995).

4.10.1 ROADWAYS

4.10.1.1 Infrastructure – Regional and Site Systems

Table 4-*22* shows the baseline traffic for several access routes based on the 1996 Rural Traffic Flow Map (State of Idaho 1996). The level of service of these segments is currently designated "free flow," which is defined as "operation of vehicles is virtually unaffected by the presence of other vehicles." The existing regional highway system is shown in Figure 4-*18*. Two interstate highways serve the regional area. Interstate 15, a north-south route that connects several cities along the Snake River, is approximately 25 miles east of INEEL. Interstate 86 intersects Interstate 15 approximately 40 miles south of INEEL and provides a primary linkage from Interstate 15 to points west. Interstate 15 and U.S. Highway 91 are the primary access routes to the Shoshone-Bannock reservation. U.S. Highways 20 and 26 are the main access routes to the southern portion of INEEL. Idaho State Routes 22, 28, and 33 pass through the northern portion of INEEL, with State Route 33 providing access to the northern INEEL facilities.

The INEEL contains an onsite road system of approximately 87 miles of paved surface, including about 18 miles of paved service roads that are closed to the public (DOE 1995). Most of the roads are adequate for the current level of normal transportation activity and could handle some increased traffic volume. The onsite road system at INEEL undergoes continuous maintenance.

Table 4-22. Baseline traffic for selected highway segments in the vicinity of the Idaho National Engineering and Environmental Laboratory.[a]

Route	Average daily traffic	Peak hourly traffic[b]
U.S. Highway 20—Idaho Falls to INEEL	2,100	315
U.S. Highway 20/26—INEEL to Arco	1,900	285
U.S. Highway 26—Blackfoot to INEEL	1,400	210
State Route 33—west from Mud Lake	600	90
Interstate 15—Blackfoot to Idaho Falls	11,000	1,650

a. Source: State of Idaho (1996).
b. Estimated as 15 percent of average daily traffic.